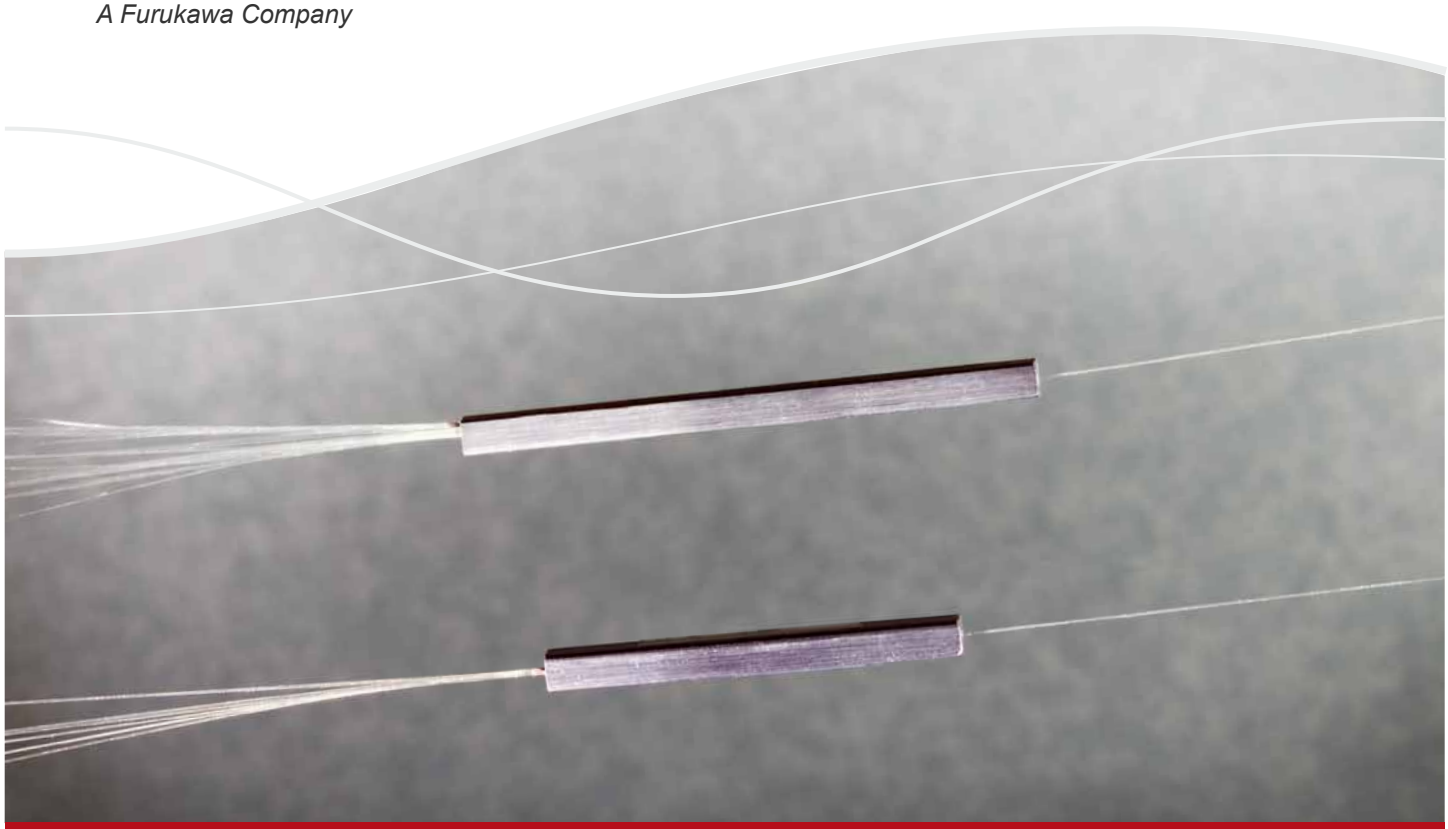
A Furukawa Company



www.ofsoptics.com

PUMP AND SIGNAL COMBINERS

for Fiber Laser and Amplifier Design

Multimode

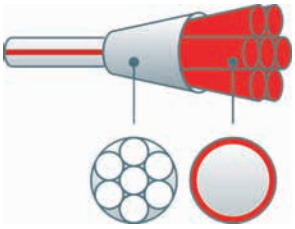
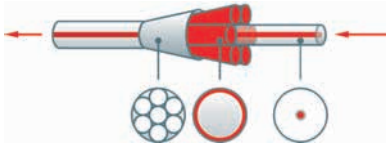
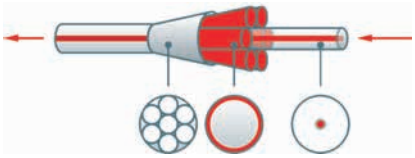
Single-mode

Polarization-Maintaining

Pump and Signal Combiners

Multimode, Single-mode and Polarization-Maintaining

Pump and Signal Combiners are available in all-fiber Multimode, Single-mode, or Polarization-Maintaining, constructions. They are designed for efficient coupling into cladding pumped fibers. Custom designs and value-added Gain Module or Laser Assemblies are also available.

Product	Typical Applications	Features and Benefits: MM, SM, PM
Multimode Multimode combiners couple 7 or 19 multimode sources into cladding pumped fiber. 	• Fiber lasers for use in the following industries: Industrial Military Medical	• Easy splicing • High coupling efficiency • Provides scalability • Compatible with 915 nm and 976 nm pump diodes with multimode pigtail fiber with 0.15 or 0.22 NA • All PM design–PM signal input and output • Thermally screened for increased reliability • Transmission checked for all ports to increase uniformity • Optimized for 1 and 1.5 µm applications • Custom combiners available upon request
Single-Mode Single-Mode Combiners couple 6 or 18 multimode sources and 1 single-mode signal source for combined power output or for use with a cladding pumped fiber. 	• This “Signal fiber design” is used for applications in the following industries: Industrial Military Medical • A single-mode combiner can be used to construct an amplifier for use in tele-communications	
Polarization-Maintaining Polarization-Maintaining combiners couple 6 multimode sources and 1 polarization-maintaining (PM) source for combined power output or for use with a PM cladding pumped fiber. 	• This “Signal fiber design” is used to construct amplifiers requiring signal polarization outputs for use in the following industries: Industrial Military Medical Telecommunications	

Pump and Signal Combiners Specifications

Multimode

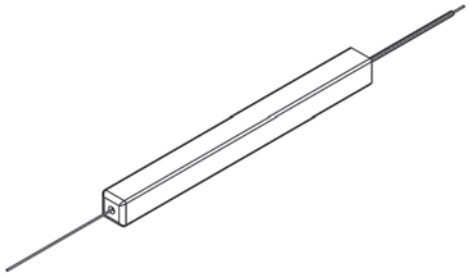
	7 : 1		19 : 1
Multimode Input Fibers			
Number of input fibers	7	7	19
Numerical aperture	.165	.22	.165
Core diameter	105 ± 3 µm	105 ± 3 µm	105 ± 3 µm
Cladding diameter	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm
Coating outer diameter	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm
Pigtail fiber length	1 meter	1 meter	1 meter
Output Fiber			
Numerical aperture	.45 ± .03	.45 ± .03	.45 ± .03
Cladding diameter	125 ± 2.5 µm	200 ± 2.5 µm	200 ± 2.5 µm
Coating outer diameter	250 ± 15 µm	300 ± 15 µm	300 ± 15 µm
Pigtail fiber length	1 meter	1 meter	1 meter
Performance			
Multimode transmission (*2)	>90%	>90%	>90%
Optical return loss	40 dB	40 dB	40 dB
Maximum total input power	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)
Operating temperature	0 to +70°C	0 to +70°C	0 to +70°C
Compatibility			
Recommended for use with these OFS cladding pumped fibers	Yb 130	Contact us for availability	Contact us for availability
Model #	TFB11A0	TFB2220	TFB4120
Order by Part #	**108869363L**	**108885633L200**	**552HPWR051**

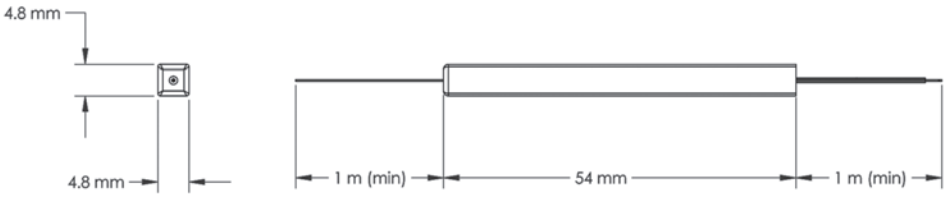
(*2) Tested by multimode input light with 70% and 99% of power confined with NA of 0.09 and 0.15, respectively.

(*3) These values are based on testing to date with 25W/leg conditions.

Combiner Mechanical Drawing

Multimode, Single-mode and Polarization-Maintaining Configurations





Pump and Signal Combiners Specifications

Single-mode

	for 1 µm Applications			for 1.5 µm Applications	
Multimode Input Fibers					
Number of input fibers	7	6	18	6	6
Numerical aperture	.165	.22	.165	.165	.22
Core diameter	105 ± 3 µm	105 ± 3 µm	105 ± 3 µm	105 ± 3 µm	105 ± 3 µm
Cladding diameter	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm
Coating outer diameter	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter	1 meter
Single-mode Signal Input Fiber					
Numerical aperture	0.15 ± .015	0.15 ± .015	0.15 ± .015	0.15 ± .015	0.15 ± .015
MFD @ operating wavelength (1060 or 1550 nm)	8.0 µm	8.0 µm	8.0 µm	10.3 µm	10.3 µm
Cladding diameter	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm
Coating Outer diameter	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm
Splice to SMF28	< 0.3 dB	< 0.3 dB	< 0.3 dB	< 0.3 dB	< 0.3 dB
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter	1 meter
Undoped Output Fiber					
Cladding numerical aperture	.45 ± .03	.45 ± .03	.45 ± .03	.45 ± .03	.45 ± .03
MFD @ operating wavelength (1060 or 1550 nm)	7.0 µm	7.0 µm	7.0 µm	6.5 µm	10.2 µm
Cladding diameter	125 ± 2.5 µm	200 ± 2.5 µm	200 ± 2.5 µm	125 ± 2.5 µm	200 ± 2.5 µm
Coating outer diameter	250 ± 15 µm	300 ± 15 µm	300 ± 15 µm	250 ± 15 µm	300 ± 15 µm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter	1 meter
Performance					
Multimode transmission (*2)	>90%	>90%	>90%	>90%	>90%
Single-mode transmission	>85%	>85%	>85%	>85%	>85%
Optical return loss (multimode)	40 dB	40 dB	40 dB	40 dB	40 dB
Maximum total input power	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)
Operating temperature	0 to +70°C	0 to +70°C	0 to +70°C	0 to +70°C	0 to +70°C
Compatibility					
Recommended for use with these OFS cladding pumped fibers	Yb 130	Contact us for availability	Contact us for availability	ErYb 130	Contact us for availability
Model #	TFB13A5	TFB2325	TFB4320	TFB13J7	TFB23C0
Order by Part #	**108667528L**	**552HPWR072**	**552HPWR050**	**552HPWR092**	**108667528H200**

(*2) Tested by multimode input light with 70% and 99% of power confined with NA of 0.09 and 0.15 , respectively.

(*3) These values are based on testing to date with 25W/leg conditions.

Pump and Signal Combiners Specifications

Polarization-Maintaining

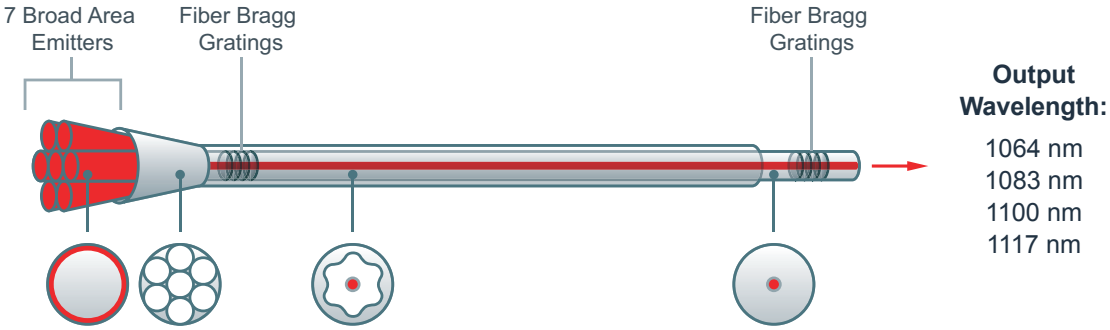
	for 1 µm Applications		for 1.5 µm Applications	
Multimode Input Fibers				
Number of input fibers	6	6	6	6
Numerical aperture	.165	.22	.165	.22
Core diameter	105 ± 3 µm	105 ± 3 µm	105 ± 3 µm	105 ± 3 µm
Cladding diameter	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm
Coating outer diameter	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter
Signal Input Fiber				
One signal fiber type	PM 980	PM 980	PM 1550	PM 1550
Numerical aperture	8.0 µm	8.0 µm	10.3 µm	10.3 µm
Cladding diameter	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm	125 ± 2.5 µm
Coating outer diameter	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm	250 ± 15 µm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter
Undoped PM Output Fiber				
Cladding numerical aperture	.45 ± .03	.45 ± .03	.45 ± .03	.45 ± .03
MFD @ operating wavelength (1060 or 1550 nm)	7.0 µm	7.0 µm	10.2 µm	10.2 µm
Cladding diameter	125 ± 2.5 µm	200 ± 2.5 µm	125 ± 2.5 µm	200 ± 2.5 µm
Coating outer diameter	250 ± 15 µm	300 ± 15 µm	250 ± 15 µm	300 ± 15 µm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter
Performance				
Multimode transmission (*1)	>90%	>90%	>90%	>90%
PM transmission	>80%	>80%	>80%	>80%
Extinction ratio @ operating wavelength (*2)	>20 dB	>20 dB	>20 dB	>20 dB
Optical return loss (multimode)	40 dB	40 dB	40 dB	40 dB
Maximum total input power	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)
Operating temperature	0 to +70°C	0 to +70°C	0 to +70°C	0 to +70°C
Compatibility				
Recommended for use with these OFS cladding pumped fibers	Yb PM 125	Yb PM 200	ErYb PM 125	Contact us for availability
Model #	TFB1353FFAxis	TFB23B3FFAxis	TFB1346FFAxis	TFB2366FFAxis
Order by Part #	**552HPWR049**	**552HPWR078**	**552HPWR047**	**552HPWR079**

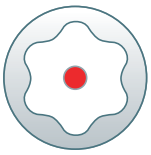
(*1) Tested by multimode input light with 70% and 99% of power confined with NA of 0.09 and 0.15, respectively.

(*2) Axis orientation is aligned for standard designs. Other alignment options are available by request.

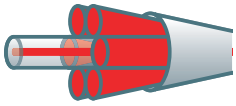
(*3) These values are based on testing to date with 25W/leg conditions.

Cladding Pumped Fiber **LASER (CPFL)**



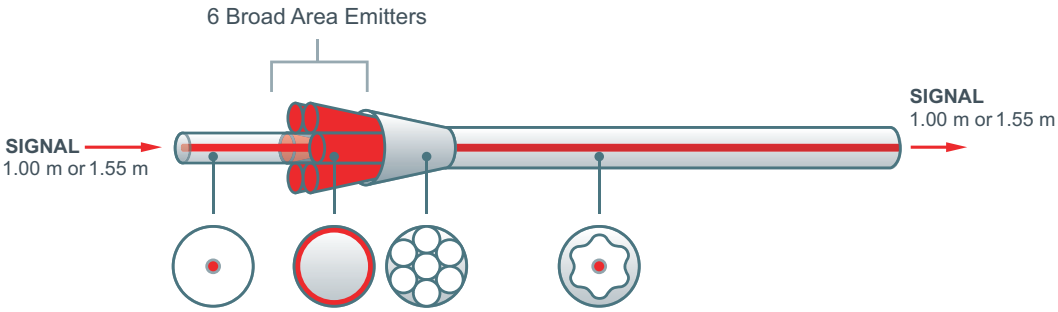


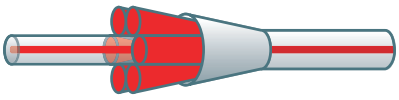
Cladding Pumped Fibers
Also Available Separately



Combiners for CPF Lasers
Multimode Input (105/125 µm)
CPF Output (0.45 NA)

Cladding Pumped Fiber **AMPLIFIER (CPFA)**





Cladding Pumped Fiber Gain Module Configurations

Includes Combiner and Cladding Pumped Fiber

Models of Gain Modules Available
Yb, PM Yb, ErYb Double & Glass Clad, PM ErYb

Custom Combiners Available

Options:

N:1

(N+1):1

1:N

Mode Field Adaptor

Single-mode and Polarization-Maintaining Feedthrough

Up to 5kW

Up to 37 Legs

Up to 1 mm Fiber Diameter

For 1 and 1.5 µm Applications

Custom Packages

A Furukawa Company

For additional information please contact your sales representative.
You can also visit our website at **www.ofsoptics.com**
or call 1-888-FIBER-HELP (1-888-342-3743) from inside the USA
or 1-770-798-5555 from outside the USA.
EMEA Specific: +49 (0) 228 7489 201

RoHS Compliant
EU Directive 2002/95/E

OFS
Marketing Communications 01/17